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A COMPARATIVE STUDY BETWEEN INTRAVENOUS STEROID INJECTION AND INTERLAMINAR EPIDURAL STEROID INJECTION IN ACUTE LUMBAR PROLAPSED INTERVERTEBRAL DISC

Medical Science

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ABSTRACT

BACKGROUND: Lifetime prevalence of low back pain can be as high as 84%. Prolapsed disc was believed to cause back and leg pain by mechanically compressing the nerve roots initially. It is well known now that leakage of the contents of the nucleus pulposus causes pain producing an inflammatory reaction in the disc itself, around the facet joint and a chemical neuroradiculitis due to the release of various inflammatory mediators. Corticosteroids have long been hypothesized to be of benefit for radicular low back pain, although evidence supporting this hypothesis has been mixed. Based upon the suggestion of early benefit, this study was carried out in patients with radicular low back pain reasoning that, as with other neurological processes, a benefit was most likely to be found if intervention was initiated early in the course of the disease symptomatology. Previous systemic literature reviews have suggested at limited interest of systemic steroids in radicular low back pain. The results of most studies have been inconclusive, and none have compared the effectiveness of systemic corticosteroid administration with that of epidural corticosteroid injection which is one of the standard treatment modality in radicular low back pain due to intervertebral lumbar disc prolapse.

OBJECTIVE: To compare effectiveness of intravenous methylprednisolone 500 mg and epidural methylprednisolone 80 mg injection in reduction of pain and disability in acute lumbar prolapsed intervertebral disc (PIVD).

METHODS: A prospective, randomised and comparative study was performed in eighty patients who were allocated to 2 groups (Group A and B). Group A (n=40) received intravenous methylprednisolone in 250ml of 5% dextrose while Group B (n=40) received interlaminar epidural steroid injection. Visual Analogue Scale (VAS) and Oswestry Disability Index (ODI) were used as outcome measures for pain and disability.

RESULTS: The reduction of pain intensity as measured by VAS score showed significant reduction at the follow up periods in group B as shown by reduction in VAS score from 7.42 to 2.10 while that in group A was 7.34 to 5.16. Reduction in Oswestry Disability Index (ODI) from 71.42 to 19.4 in Group B was significantly more than that of radiating pain 70.89 to 42.68 in Group A (p=0.000).

CONCLUSION: Single dose of interlaminar epidural methylprednisolone injection is found to be more effective than intravenous methylprednisolone injection in reducing pain and disability in acute PIVD.

KEYWORDS

Steroid, Lumbar Prolapsed Disc, Epidural Injection, VAS, ODI

INTRODUCTION

The lifetime prevalence of low back pain is as high as 84%.[1] The 2010 Global Burden of Disease Study highlighted that low back pain is among the top 10 diseases and injuries that account for the highest number of Disability-Adjusted Life Years (DALYs) worldwide.[2] A subset of patients with low back pain have radicular symptoms, which are often attributable to specific spinal pathology such as a herniated intervertebral disc.[3] Determining the precise cause of radicular low back pain in young, healthy patients is unnecessary because initial medical management is identical, once infectious, neoplastic, rheumatological, and vascular pathologies have been excluded.3 Despite optimal treatment, persistent pain or functional disability one month after an initial episode occur in two-thirds of patients who present to a medical provider.4 Those with radicular signs or symptoms are at higher risk of poor outcome.[4]

The causes of LBP and radiating leg pain are complex. Initially, prolapsed disc was believed to cause back and leg pain by mechanically compressing the nerve roots. Now, it's well known that leakage of the contents of the nucleus pulposus, causes pain producing inflammatory reaction in the disc itself, around the facet joint and a chemical neuroradiculitis due to the synthesis of various inflammatory mediators.[5] Inflammatory mediators such as phospholipase A2, tumor necrosis factor-α, interleukin-6, interleukin-8, and prostaglandin E2 have been found in degenerative and herniated disk material.[6]

The treatments used for this problem may be categorized as conservative management, epidural steroid injection, and surgery.[7] Corticosteroids have long been hypothesized to be of benefit for radicular low back pain, although evidence supporting this hypothesis has been mixed. Suppression of the biochemical factors of inflammation is the rationale behind the use of corticosteroids in LBP leading to reduction in soft-tissue swelling, oedema, pressure, soft adhesions and slow regression of disc herniation.[7] The value of local delivery of corticosteroids to the putative anatomical source of pain has also demonstrated mixed results, although in a highly selected population.[8] Riew et al[9] studied 55 patients with lumbar radiculopathy who were all considered surgical candidates. Seventy-one percent of the patients who received a nerve root injection with steroid cancelled surgery.[9] Only 33% of the patients who received a local anesthetic injection without steroid cancelled surgery, indicating a significant reduction of surgical rates from the steroid component.[9] In patients with chronic radicular pain, corticosteroids do not improve outcomes compared to injection of local anesthetic alone.[10] This indicates that epidural steroid injections are more effective for acute radicular pain with a significant inflammatory pain component.

Based upon the promises of early benefit, this study was carried out in patients with radicular low back pain reasoning that, as with other neurological processes, a benefit was most likely to be found if intervention was initiated early in the course of the disease symptomatology.[11]

Previous systemic literature reviews have suggested at limited interest of systemic steroids in radicular low back pain. Systemic administration of corticosteroids has not been studied as extensively as epidural injections. The results of most studies have been inconclusive, and none have compared the effectiveness of systemic corticosteroid administration with that of epidural corticosteroid injection.[12] Epidural steroid injection is one of the standard treatment modality in intervertebral lumbar disc prolapse. They are used with increasing frequency as a less invasive, potentially safer, and more cost-effective treatment.[13]

Hence, this study is aimed at comparing the effectiveness of intravenous methylprednisolone 500 mg and epidural methylprednisolone 80 mg injection in reduction of pain and disability in acute lumbar prolapsed intervertebral disc.

MATERIALS AND METHODS

A prospective, randomised and comparative study on 80 patients presenting with low back pain radiating to the lower limb admitted in the Physical Medicine and Rehabilitation ward, Regional Institute of Medical Sciences (RIMS), Imphal, India, was conducted from September 2016 to July 2017.

Approval from the Research Ethics Board, RIMS, Imphal was taken before the start of the study and written informed consent was obtained from all the subjects.

Patients with back pain due to PIVD L4-L5 and L5-S1, confirmed by MRI (Grade II and III), age between 20 and 60 years, with duration of symptom less than 1 month, pain severity with minimum score of 5 based on 10 point scale VAS (Visual Analogue Score), ODI (Oswestry Disability Index) score more than 40, willingness to comply with treatment and follow-up assessments were included in the study. However, patients with cauda equina syndrome, mental or physical condition that would invalidate evaluation results, prior lumbar surgery at any level, multiple level disc prolapse, pregnancy, systemic or local infection at site of injection, known allergy to corticosteroids, anesthetics, history of any malignancy (including hematologic and non-hematologic malignancies), bleeding disorders, uncontrolled diabetes mellitus, uncontrolled hypertension and subjects who refuse to sign informed consent were excluded from the study.

Patients enrolled in the study were assigned to two groups (Group A and B) by using block randomisation technique [Table 1].

Group A received intravenous methylprednisolone 500mg (solumedrol) in 250ml of 5% dextrose while Group B received a single dose of interlaminar epidural steroid injection with methylprednisolone 80 mg (depomedrol). All patients received paracetamol (650mg 2-3 times daily) for pain control, directions to engage in activity as tolerated.

Study variables were age, sex, occupation, duration of pain and side of pain.

Study instruments included pre tested proforma; X- ray spine (AP and Lateral views); MRI spine and SIEMENS Multimobil 5E C-arm.

Pain measured by Visual Analogue Scale (VAS) and functional disability measured by ODI (Oswestry Disability Index) were the outcome measures.

Methylprednisolone 500mg diluted in 250ml of 5% dextrose, administered i.v. over 1.5 hours, was given in all patients enrolled in Group A.

For fluoroscopic guided interlaminar epidural steroid injection in Group B, patient was placed prone with a pillow under lower abdomen. The area was prepared by antiseptics and draped in sterile manner. After identifying the desired interlaminar space, a guiding needle was placed on the skin and the C-arm was positioned so that the midline of the interlaminar space was correctly identified. Skin was then anesthetized with 1% lidocaine. The epidural needle (20 gauge Tuohy) was placed in the direct midline position. After penetrating the interspinous ligament, the stylet was removed and the needle was connected to a 5 cc, "three ringed" glass syringe that was half filled with air. Using gentle pressure on the plunger of the syringe, the needle was slowly advanced towards the ligamentum flavum, and subsequently into the epidural space, while intermittent lateral fluoroscopic views were obtained to ascertain the needle depth. Once the needle reached the epidural space with appropriate loss of resistance to air, 1 mL of non-ionic contrast was injected to confirm epidural placement. A lateral fluoroscopic image as well as an antero-posterior image were obtained. If no intravascular or soft tissue contrast pattern was seen, injection methylprednisolone 80 mg was given slowly into the epidural space. Then, the needle was removed and covered with a sterile pad. Patient was advised bed rest in supine position for 2 hours.

Follow up assessments were done at 24 hrs, 48 hrs and 1 week.

STATISTICAL ANALYSIS

Data analysis was done using Statistical Package for Social Sciences (SPSS) version 21. Descriptive analysis including mean, percentage, standard deviation were used. Chi square test was used for categorical variables. Independent t-test used for significant test between group comparison of mean scores. Value of $p < 0.05$ was considered to be statistically significant.

RESULTS

Table 1. Baseline characteristics of the patients.

Variables		IV group	Epiduralgroup
Age (years)	20-30	3	4
	31-40	8	7
	41-50	17	18
	51-60	12	11
Gender	Male	18	17
	Female	22	23
Occupation	Housewife	16	15
	Manual worker/farmer	12	13
	Office goers	7	8
	Sedentary	5	4
Side	Left	22	23
	Right	18	17
Diagnosis	PIVD L4-5	19	20
	PIVD L5-S1	13	12
	Both	5	6
	L1-2/ L2-3/ L3-4	3	2

P> 0.05, Pearson chi-square test

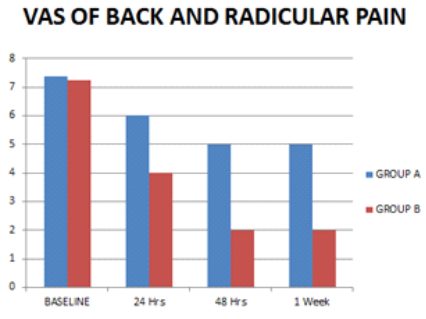


Figure 1

Table 2

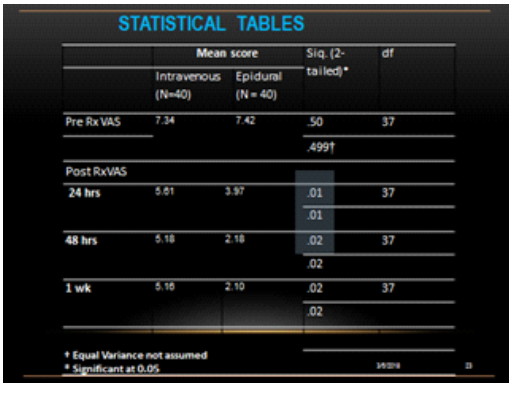
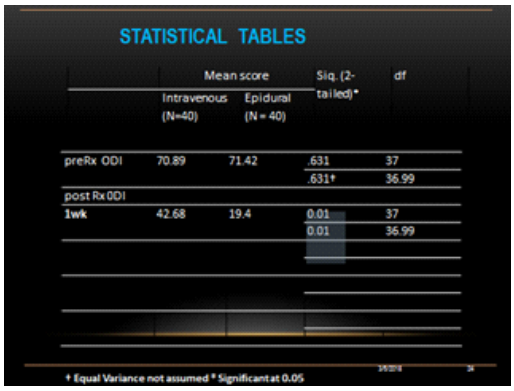


Table 3



There were no significant differences in the baseline characteristics of the two groups in pain, functional ability and medication use and hence were comparable (p> 0.05).

Patients in the age group 41-50 years constituted 42.3% (n=33) and females constituted 56.4% (n=44) of the total patients. PIVD L4-L5 was found in 48.7% (n=38) of the patients. The reduction of pain intensity as measured by VAS score showed significant reduction at the follow up periods in group B as shown by reduction in VAS score from 7.42 to 2.10 while that in group A was 7.34 to 5.16 [Table 2].

Reduction in Oswestry Disability Index (ODI) at 1 week from 71.42 to 19.4 in Group B was significantly more than that of Group A- 70.89 to 42.68 (p=0.000) [Table 3].

Reduction in pain and improvement in functional score were significantly more in patients receiving epidural steroid (p=0.000) [Table 2 and 3].

DISCUSSION

The rationale for using steroids originates from the studies showing abnormal concentrations of nociceptive and inflammatory mediators around lumbosacral disc herniations causing a chemical neuroradiculitis.[5] Corticosteroids, by inhibiting prostaglandin synthesis, limit both cell mediated and humoral immune responses. These drugs also stabilize cellular membranes and blocks nociceptive C-fiber conduction.

Steroids can be delivered to the site of inflammation by systemic and/or local treatment. ESI is a kind of local therapy in this regard. This type of management has, however, some advantages over systemic therapy, such as getting higher concentrations of the drug to the diseased area and notably having a lower rate of systemic adverse effects like neuro-endocrine axis suppression and hyperglycaemia along with a negative impression on bone metabolism.[14]

Epidural steroid injection reduces nerve root edema and inflammation in a more localised fashion. Optimal timing of ESIs is unknown, although there is evidence of better benefit if ESIs are performed within 3 months of radicular pain onset.[15] A potential advantage of the IV pulse therapy is the ability to distribute glucocorticoid concentrations to the area surrounding the prolapsed disc without the risks and inconveniences of an epidural injection.[17]

ESIs can be easily done in an ambulatory setting in order to allow the continued activity of the patient, the avoidance of narcotics with their adverse side effects, and hospitalization which contributes to cost and prolonged impairment. The procedure is simple, easy to administer, and is known to be free of the complications associated with prolonged use of corticosteroids. This can provide an effective early response providing relief to the patient as well as the provider who is confronted with the problem of what to do with his or her patient who has acute pain and impairment requiring a timely response.

Wang JC et al[16] found that epidural steroid injections have reasonable success for radicular symptoms from lumbar herniated disc for upto 12 to 27 months. Finckh A et al[17] reported that IV glucocorticoids provided significant improvement in sciatic leg pain, but the effect size was small and of short duration.

Patients in the present study showed significant amount of improvement with ESI as shown by reduction in pain and improvement in functional activity of the patients. The absence of complications like dural puncture and excessive bleeding that usually complicate blind epidural injections confirms the safety of fluoroscopically guided approach. In the present study, we have used two instruments to assess the outcomes. VAS showed postprocedure improvement rating as compared to preprocedure rating in ESI group. Again Oswestry disability questionnaire provided the improvement in quality of life because of pain relief. In summary, this study showed that ESI is a reliable method of providing statistically significant early pain relief in patients having acute low back pain secondary to prolapsed disc.

Non-blinding nature of the study, small sample size and shorter follow up are the main limitations of the study. Further research including a blinded, prospective cohort study will be of value.

CONCLUSION

Interlaminar epidural methylprednisolone injection is found to be more effective than intravenous methylprednisolone injection in reducing pain and disability in acute PIVD.

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